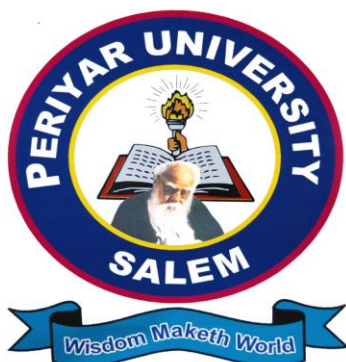


**PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636 011**



**DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM
SYLLABUS FOR M.Sc. FOOD & NUTRITION
FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2021 – 2022 ONWARDS**

M.Sc. FOOD & NUTRITION

REGULATIONS AND SYLLABUS

(With effect from the academic year 2021-2022 onwards)

Preamble

The post graduate program in Food and Nutrition has been designed to provide students a vast scope ranging from alleviation of malnutrition, preventive, promotive and therapeutic care in hospitals, in food industries as well as food service managers in various establishments. The specialists in Food and Nutrition play a vital role in promoting the quality of life of individuals and communities, which contributes significantly to the economic and overall development of the nation.

Program objectives

1. To impart knowledge and develop capacities of the students through state of the art higher education in the area of Food and Nutrition
2. To provide practical, field level experience in food industries and hospitals
3. To provide professionally competent manpower for academic and research institutions; hospitals and food industries; nutrition and health programs; food safety and quality control; consultancy and entrepreneurship

Eligibility for admission

An under graduate degree in Food and Nutrition/ Nutrition and Dietetics/ Food science and Nutrition/ Clinical nutrition and Dietetics/ Nutrition, Food service management and Dietetics/ Home Science.

Duration of the program

Two academic years consisting of 4 semesters

Program specific outcome

The student will know, understand, apply, analyze, evaluate and able to build relationship between food, nutrition and healthy life and shine as trained professionals in areas such as Public nutrition, Dietetics and Clinical Nutrition, Food science and Food Quality Control.

Program structure for M.Sc. Food and Nutrition (2021-22 onwards)

SEM	CODE	COURSE	Hrs	Credits	Marks			Examination (Hrs)
					IA*	EA**	TOTAL	
I	Core Paper 1	Food Science-1	5	4	25	75	100	3
	Core Paper 2	Nutrition Through Life Cycle	5	4	25	75	100	3
	Core Paper 3	Physiological Aspects of Nutrition	5	4	25	75	100	3
	Core Paper 4	Macronutrients	5	5	25	75	100	3
	Elective 1	Food Microbiology and Preservation	5	4	25	75	100	3
	Core Practical1	Food Composition Analysis Practical	5	3	40	60	100	3
II	Core Paper 5	Nutritional Biochemistry	5	5	25	75	100	3
	Core Paper 6	Food Science-II	4	4	25	75	100	3
	Core Paper 7	Medical Nutritional Therapy-I	5	4	25	75	100	3
	Elective 2	Food Processing and quality control	5	4	25	75	100	3
	Core Practical2	Food Quality Control practical	5	3	40	60	100	3
	EDC	Extra disciplinary Course	4	2	25	75	100	3
	HR	Human Rights	2	2(extra)	25	75	100	3
	Online Course	SWAYAM/MOOC	-	4(extra)	-	100	100	3
III	Core Paper8	Research methodology for nutrition and statistics	5	4	25	75	100	3
	Core Paper9	Medical Nutritional Therapy-II	5	4	25	75	100	3
	Core Paper10	Micronutrients	5	5	25	75	100	3
	Core Paper 11	Community Nutrition	5	4	25	75	100	3
	Elective 3	Food Biotechnology	5	4	25	75	100	3
	Core Practical3	Medical Nutritional Therapy Practical	5	3	40	60	100	3
	Core Viva Voce 1	Internship Report	-	3	40	60	100	3
IV	Core Paper 12	Nutrition for Health and Fitness	5	5	25	75	100	3
	Elective 4	Nutraceuticals	5	4	25	75	100	3
	Core Practical4	Biochemical Techniques Practical	5	3	40	60	100	3
	Core Viva Voce 2	Dissertation	15	5	40	60	100	3
TOTAL			120	90+6 (extra)			2500	

* IA- Internal Assessment

**EA-External Assessment

Courses offered

The following courses are offered according to the syllabus and books prescribed from time to time.

Core courses- Theory

Core course 1	Food science-I
Core course 2	Nutrition through life cycle
Core course 3	Physiological aspects of nutrition
Core course 4	Macronutrients
Core course 5	Nutritional biochemistry
Core course 6	Food science-II
Core course 7	Medical nutritional therapy-I
Core course 8	Research methodology for nutrition and statistics
Core course 9	Medical nutritional therapy-II
Core course 10	Micronutrients
Core course 11	Community Nutrition
Core course 12	Nutrition for health and fitness

Core courses- Practical

Core practical 1	Food composition analysis practical
Core practical 2	Food quality control practical
Core practical 3	Medical nutritional therapy practical
Core practical 4	Biochemical Techniques practical

Core courses- Viva voce

Core viva voce 1	Internship report
Core viva voce 2	Dissertation

Elective courses

Elective course 1	Food microbiology and preservation
Elective course 2	Food processing and quality control

Elective course 3 Food biotechnology

Elective course 4 Nutraceuticals

Other compulsory courses

EDC Extra disciplinary course

HR Human rights (Common to all PG)

Online course SWAYAM/MOOC

Examinations

Examinations are conducted in semester pattern. The examination for the Semester I & III will be held in November/December and that for the Semester II and IV will be in the month of April/May. Candidates failing in any subject (both theory and practical) will be permitted to appear for such failed subjects in the same syllabus structure at subsequent examinations within next 5 years.

Scheme for Evaluation

Theory Examination

Scheme for **internal marks** (25 marks)

Assignment - 5 marks

Seminar with PPT presentation - 5 marks

Tests - 10 marks (Average of best 2 out of 3 tests)

Attendance - 5 marks

Scheme for **external marks** (75 marks)

Part A

Answer all the questions (Objective type) (15x1=15 marks)

Part B

Answer any 2 questions (Analytical question) (2x5=10 marks)

Part C

Answer all the questions (descriptive type internal choice questions) (5x10=50 marks)

Equal weightage will be given to all the units in all parts of the question paper.

Practical examination

Scheme for **internal marks** (40 marks)

Good laboratory practices - 10 marks

Performance evaluation based on observation note and record - 15 marks

Internal tests (Average of best 2 out of 3 tests) - 10 marks

Attendance - 5 marks

Scheme for **external marks** (60 marks)

Record - 10 marks

Practical - 50 marks

Dissertation

Internal evaluation (40 marks)

Innovative idea - 10 marks

Performance evaluation - 10 marks

Report preparation - 20 marks

External evaluation (60 marks)

Report and presentation - 40 marks

Viva voce - 20 marks

Passing minimum

A candidate who secures not less than 50% in the internal mark as well as not less than 50% in the external mark in the duly conducted examinations in the above mentioned pattern for the respective courses shall be declared to have passed the examination conducted for those particular courses. For practical examinations, submission of record notebook is a must.

Grading

Grade of marks	Grade points	Letter grade	Description
90-100	9.0 - 10.0	O	Outstanding
80-89	8.0 - 8.9	D+	Excellent
75-79	7.5 - 7.9	D	Distinction
70-74	7.0 - 7.4	A+	Very Good
60-69	6.0 - 6.9	A	Good
50-59	5.0 - 5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Ranking

Candidates who pass all the examinations prescribed for the program in the first appearance and within the minimum stipulated time from the year of admission only are eligible for University Ranking.

Commencement of this regulation

These regulations may take effect from the academic year 2021-2022 for the students admitted from the academic year 2021-2022 and thereafter until further notice.

SEMESTER-I

Core Paper: 1

FOOD SCIENCE-I

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Understand the composition and nutritive value of cereals, pulses, milk and milk products.
2. Understand the changes that are taking place in cereals, pulses and milk during cooking.

Outcome

1. Distinguish and relate the characteristics and properties of foods
2. Comprehend the knowledge gained on characteristics and properties of cereals, pulses, milk and milk products during cooking
3. Apply the properties of cereals, pulses, milk and milk products in various food processing and preparations
4. Analyze the factors affecting cooking quality of cereals, pulses, milk and milk products
5. Develop appropriate food preparation and processing methods to ensure quality standards.

UNIT-I

Food: Properties of food – Physical properties, Acids and bases in foods; Colloids – Types and Properties; Sols – Properties; Gels – Properties and factors influencing gel formation; Emulsion – Types, formation, properties and stability of emulsions; Foams – Formation, stability and anti foaming agents.

UNIT-II

Cereals: General structure, composition, Nutritive value of rice, wheat, maize, oats and jowar.

Millets: Composition, Nutritive value and uses of pearl millet, finger millet, proso millet.

Breakfast cereal – Uncooked breakfast cereals and ready to eat cereals.

UNIT-III

Cereal cookery: Cereal protein- Gluten formation and factors affecting; Cereal starch, effect of moist heat – Gelatinisation, factors affecting gelatinisation, Changes in cooked starches- Gel formation, retrogradation and syneresis; Effect of dry heat- Dextrinisation; Effect of cooking on nutritive value, Points to be remembered in cereal cookery, Role of cereal in cookery.

UNIT-IV

Pulses: Composition and nutritive value, Digestibility of pulses and factors affecting the digestibility of pulse proteins, Toxic constituents in pulses and their elimination; commonly used pulses.

Pulse cookery: Effect of cooking, Factors affecting cooking quality, Utilization of pulses, Role of pulses in cookery and pulses in human nutrition.

UNIT-V

Milk and Milk products: Composition of milk, Nutritive value of milk and milk products, Physical and chemical properties of milk, Types of milk available in the market (whole milk, skim milk, homogenised milk, flavoured milk, evaporated milk, sweetened condensed milk, powdered milk, UHT milk, lactose reduced milk, standardized milk, toned milk, double toned milk).

REFERENCES

1. Srilakshmi. B; Food Science, 6th edition, New Age International (P) Limited Publishers, 2015.

2. Shakunthala Manay. N; Shadakshara Swamy.M; Foods Facts and Principles, 3rd edition, New Age International (P) Limited Publishers, 2014.
3. Lillian Hoagland Meyer, Food chemistry, CBS Publishers and Distributors, 2004.
4. Arindam Ramaswamy, Elements of Food Science, Oxford Book Company, 2010.
5. Norman. N Potter, Joseph H. Hotchkiss, Food Science, 5th edition, CBS Publishers and Distributors, 1996.
6. Sivasankar. B; Food Processing and Preservation, PHI Learning Private Limited, 2011.

Web Resources:

- <https://guides.libraries.psu.edu/foodscience>
- <https://www.nal.usda.gov/fnic/food-science-and-technology>
- <https://foodinfo.ifis.org>

SEMESTER-I

Core Paper: 2 NUTRITION THROUGH LIFE CYCLE

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Understand the Computation of nutritional allowances.
2. Understand the importance of nutrition during life span.

Outcome

1. Understand and apply nutritional assessment techniques
2. Understand growth and development and nutritional requirement during pregnancy and lactation to promote healthy living in the community
3. Know about growth and development and nutritional requirement of school going children and adolescents
4. Acquire the knowledge on growth and development and nutritional requirement during infancy and preschool age
5. Know the nutritional needs of adults and elderly
6. Apply computation of nutritional allowance and the importance of nutrition during life span

UNIT-I

Nutrition during Pregnancy: Prenatal growth and development, Nutritional requirements, RDA, Weight gain during pregnancy, Relationship between maternal and foetal nutrition, Teen age pregnancy and diet, General gastro intestinal problems and complications of pregnancy.

UNIT-II

Nutrition during Lactation: Physiological process of lactation, Nutritional requirements, RDA, Breast feeding- Colostrum and mature milk. Advantages of breast feeding- Nutritional benefit, hormones and growth, immunological benefits, psychological and economic, environmental benefits, infant and child morbidity. Barriers to breast feeding, Low milk production.

UNIT-III

Nutrition during Infancy: Infant growth and physiological development, Nutritional requirements for growth, RDA, Artificial feeding. Low birth weight and Preterm baby- Nutritional requirements, feeding the preterm baby, feeding problems. Weaning- Need for weaning, types of supplementary foods, problems in weaning.

Nutrition in Preschool children: Growth and development, nutritional requirements, RDA, feeding dental problems, decay. Nutrition related problems of preschool children – Protein energy malnutrition- Types, symptoms, nutritional requirements and treatment.

UNIT-IV

Nutrition in School children: Nutritional requirements, RDA, Feeding problems, Packed lunches, Supplementary foods.

Nutrition in Adolescents; Growth and development, Nutritional requirements, RDA, Nutritional problems- Obesity, eating disorders, predisposition to osteoporosis, anaemia, undernutrition, pre-menstrual syndrome, mal nutrition due to early marriage.

UNIT-V

Nutrition in Adults: Growth and development, Nutritional requirements, RDA.

Nutrition in Old age: General physiologic changes, Theories on the causes of aging, Nutritional requirements, Nutrition related problems of old age, Degenerative diseases. Alzheimer's disease- Cause, physical effects and nutrition consideration. Guidelines for promoting healthful eating in old age, Exercise in old age.

REFERENCE

1. Gordon. M. Wardlaw et.al; Contemporary Nutrition, 2nd edition, Publishing by Mosby, 2004.
2. Srilakshmi. B; Dietetics, 7th edition, New Age International (P) Limited Publishers, 2014.
3. William's; Nix; Basic Nutrition and Diet therapy, 14th edition, Publishing by Mosby, 2013.
4. Mahtab S.Bamji, Prasad Rao, N.Vinodini Reddy; Textbook of Human Nutrition, Second Edition Oxford and IBH Publishing Co. Pvt .Ltd, 2003.
5. Nutrient Requirement and Recommend Dietary Allowances for Indians by Indian council of Medical research, National Institute of nutrition, Hyderabad.
6. Judith E. Brown., Nutrition Now, 2nd edition, West / Wadsworth west / Wadsworth, An International Thomson publishing company, 1998.

Web Resources:

- <https://www.universalclass.com/articles/health/nutrition/nutritional-needs-for-differentages>.
- <https://www.nutrition.org.uk/nutritionscience/life.html>
- <http://www.open.edu/openlearncreate/mod/oucontent/view.php>

SEMESTER-I

Core Paper: 3 PHYSIOLOGICAL ASPECTS OF NUTRITION

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Advance their understanding of some of the relevant issues and topics of human physiology.
2. Understand the integrated functions of all systems and the grounding of nutritional science in physiology.

Outcome

1. Understand and distinguish the functions of organs in the body.
2. Comprehend the anatomy of the various organs.
3. Illustrate the processes of the respective system.
4. Get sensitized about reproductive system and functions

UNIT I

Structure and functions of animal cell and its organelles with special reference to structure and function of cell membranes (their role in the control of the transport of solutes across the membrane) and nucleus.

Adipose tissue – Structure, composition, types, deposition of triglycerides in adipose tissue, formation of fat stores from non lipid and dietary lipids, role of brown adipose tissues in thermogenesis.

Immunity – Human immunoglobulins, cell mediated and humoral immunity; innate immunity – activation of WBC and production of antibodies. Introduction to T cells and B cells. Role of thymus.

UNIT II

Digestive system – Structure and functions of gastro intestinal tract, gastro intestinal motility, salivary gland function, nature and control of stomach and pancreatic secretions, biliary system, digestion and absorption in small and large intestines, regulation of food intake –hunger, appetite and satiety.

Respiratory system – Structure of lungs and gaseous exchange (transport of oxygen and carbon-di-oxide).

UNIT III

Cardio vascular system – Blood: Composition and functions, structure and function of heart and blood vessels, regulation of cardiac output and blood pressure, heart failure and hypertension.

Excretory system – Structure and functions of kidney, structure of nephron, physiology of urine formation, micturition; Structure and functions of skin.

UNIT IV

Nervous system – Structure and functions of brain (briefly) and spinal cord; structure and functions of neuron; conduction of nerve impulse, role of neuro transmitters; blood brain barriers, CSF, hypothalamus and its role in various body functions.

Musculo skeletal system – Structure and functions of bone; physiology of muscle contraction.

UNIT V

Reproductive system – Structure and functions of gonads, menstrual cycle, fertilization, physiological changes in pregnancy, parturition, lactation and menopause.

Endocrine system – Structure, function, role of hormones, regulation of hormone secretion and disorders – pituitary, thyroid, adrenal, pancreas and parathyroid glands.

REFERENCES

1. Ganongs. W.F; Review of medical physiology, 1985.
2. Campbell. E.J et al; Clinical and applied physiology, 1984.
3. Guyton AC and Hall JB; Textbook of medical physiology, 1996.
4. Guyton AC; Functions of human body, 1985.
5. Wilson KJW and Waugh A; Ross and Wilson. Anatomy and Physiology in health and illness, 8th edition, 2003.

Web Resources:

- <http://physiology.forumshealth.com/>
- <https://www.pdfdrive.com/physiology-books.html>

SEMESTER-I

Core Paper: 4 MACRONUTRIENTS

SUB CODE:

Hours: 5

Marks: 100

Credit: 5

Objectives

1. To understand the structure and functions of macro nutrients in human body.
2. To understand the effects of deficiency and excess of macro nutrients in human Body

Outcome

1. Understand the role of energy in various physiological conditions of the body.
2. Know the nutritional significance and health benefits of macronutrients.
3. Explore the role of dietary fibre, amino acids and fatty acids in human nutrition and disease.

4. Acquire skills to evaluate protein quality

5. Comprehend on the water balance and assessment of hydration status

UNIT I

Carbohydrates – Introduction, Classification – (Based on) degree of polymerization, digestive fate of carbohydrates. Functions, food sources, requirements, digestion, absorption and metabolic utilization of carbohydrates, Regulation of blood glucose concentration. Glycemic index-Factors affecting GI of foods. Dietary fibre- Introduction, Types, Properties, RDA and Components of dietary fibre. Role of fibre in human nutrition.

UNIT II

Lipid-Introduction, Classification, Function, Foodsources, Requirements, RDA, digestion, absorption, transport and storage. Lipids and gene expression. Dietary fat and coronary heart disease. Fatty acid- Types, Functions, Requirements, food sources and deficiency.

Omega fatty acids – Classification, role in good health, daily values, food sources, fortification of food with omega fatty acids.

UNIT III

Proteins- Introduction, Classification, Functions, Requirements and RDA, Food sources, Digestion, absorption and metabolic utilization of protein, Quality of proteins.

Amino acid: Types, functions, food sources, requirements, deficiency. Therapeutic applications of specific amino acids. Peptides of physiological significance. Proteins, amino acids and gene expression.

UNIT IV

Energy – Introduction, units, determination of energy value of food, physiological fuel value, Benedict's Oxy-calorimeter, relation between oxygen required and calorimeter value. Basal Metabolic rate – Introduction, measurement of basal metabolism, determination of basal metabolic rate by calculation, energy requirement during work, Thermic effect of food, Total energy requirement – Meaning, measuring total energy requirement, factors affecting: physical activity, basal metabolic rate and thermic effect of food, Dietary source, RDA.

UNIT IV

Water and electrolytes – Introduction, water, electrolytes and body composition, body water distribution, body electrolyte content : Distribution and exchangeable fractions, Intracellular water and the body cell mass concept, regulation of body water compartments, metabolic links: glucose, water and sodium. Body water compartments in chronic starvation, Impact of acute pathological conditions on the ICW, Body water in acute illness, water and electrolyte metabolism during refeeding, Implications of water and sodium metabolism in nutrition therapy for specific clinical condition .

REFERENCES

1. Michael. J. Gibney etal; clinical nutrition Blackwell science , 2005.
2. Shubhangini. A. Joshi; Nutrition and Dietetics III edition, McGraw Hill Education (India) private limited
3. Srilakshmi.B; Nutrition Science, 15th edition, New Age International (P) Limited, Publishers, 2016.
4. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I 2nd edition. The Bangalore Printing and Publishing Co., LTD, Reprint 2015.
5. Sunetra Roday; Food Science and Nutrition, 2nd edition, Oxfore University Prerss, 2013
6. Carol Byrd – Bredbenner; Wardlaw’s perspecctives in Nutrition, 9th edition MCGraw –

Web Resources:

<http://www.nutritionfoundationindia.res.in>

nhp.gov.in/healthyliving/healthydiet

<http://www.nin.res.in>

SEMESTER-I

FOOD MICROBIOLOGY AND PRESERVATION

Elective Paper: 1

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Understand and apply the role of micro-organisms in spoilage of food and application of preservation techniques to increase the shelf life of food materials.
2. Develop an understanding about the latest developments in preservation methods.

Outcome

1. Understand the general morphology of microorganisms, the growth inhibiting and promoting factors for microorganisms.
2. Categorize the sources, contamination and spoilage respective food groups and infer suitable presentation techniques.
3. Enumerate food poisoning food born hazards and food intoxication of microbial origin to ensure food safety.
4. Know the principles of preservation behind the methods of preservation.
5. Explore the principle of food preservation with nutritive value.

UNIT I

Importance of micro-organisms in food- Primary sources of micro-organisms in food, intrinsic and extrinsic parameters of food affecting microbial growth. Isolation and detection of micro-organisms in food. Spoilage of food- Principles, types of spoilage and micro-organisms causing spoilage of perishable, semi perishable and non-perishable foods.

UNIT II

Principles and methods of food preservation. Preservation by use of High temperatures- Factors affecting heat resistance, heat resistance of microorganism and their spores, determination of heat resistance, thermal-death-time curves, 12D concept, heat penetration, determination of thermal processes, heat treatments employed in processing foods.

UNIT III

Preservation by use of low temperatures- Low-temperature methods- Refrigeration, cool storage and freezing. Low- temperature-Microbial activity, characteristics, factors affecting the quality of foods and packaging requirements for foods.

Preservation by drying and dehydration- Methods, advantages and disadvantages. Factors in the control of drying, treatments of food before drying, procedures after drying, microbiology of dried foods.

UNIT IV

Food irradiation- Introduction, electromagnetic energy, ionizing radiation, kinds of ionizing radiation and their applicability on food processing, mode of action, potentialities for radiation processing of foods, effects of food irradiation, safety of irradiated foods.

Fermentation of foods - advantages and disadvantages, types, factors controlling fermentation, commonly fermented foods- sauerkraut, wine, vinegar, beer, temph, soya sauce.

UNIT V

Food additives- Introduction, classification of food additives – Preservatives, antioxidants, emulsifiers, stabilizers and thickeners, sequestering and buffering agents, bleaching and maturing agents, food colours, flavouring agents and flavor boosters, nutrient supplements, non-nutritive and special dietary sweeteners, anti-caking agents,

foaming and anti-foaming agents, leavening agents, firming agents humectants and texturisers and clarifying agents: Nature, characteristics and use of additives in foods.

Packaging technology- Introduction, packaging materials, retort pouch materials, types of packaging, effects of packaging on the nutritive value of foods.

REFERENCE

1. Srilakshmi. B; Food Science, 6th edition, New Age International (P) Limited Publishers, 2015.
2. Shakunthala Manay. N; Shadakshara Swamy.M; Foods Facts and Principles, 3rd edition, New Age International (P) Limited Publishers, 2014.
3. Lillian Hoagland Meyer, Food chemistry, CBS Publishers and Distributors, 2004.
4. Subbulakshmi. G and Shobha. A.U; Food processing and preservation, New Age International (P) Limited Publishers, 2014.
5. Norman. N Potter, Joseph H. Hotchkiss, Food Science, 5th edition, CBS Publishers and Distributors, 1996.
6. Sivasankar. B; Food Processing and Preservation, PHI Learning Private Limited, 2011.

Web Resources:

- <http://www.foodsafe.ca>
- http://www.bclaws.ca/civix/document/id/complete/statreg/08028_01

SEMESTER-I

Core practical:1 FOOD COMPOSITION ANALYSIS PRACTICAL

SUB CODE:

Hours: 5

Marks: 100

Credit: 3

Outcome

1. Understand the need for analysis and instrumentation
2. Identify an appropriate technique for analysing specific substances
3. Learn the principles of different instruments used for analysis
4. Have an insight into the advanced techniques in food and nutrient analysis

Experiments to be done in the lab before and after suitable processing of food sample

1. Ash content
2. Moisture content by hot air oven method
3. Crude fibre
4. Protein by Lowry's method
5. Nitrogen by Kjeldahl method
6. Iodine Number of oil
7. Saponification number of oil
8. Acid Number of oil
9. Iron
10. Phosphorus
11. Calcium
12. Vitamin –C

Experiments to be demonstrated

13. Thiamine

14. Riboflavin
15. Sodium
16. Potassium
17. Vitamin A / β carotene
18. Energy value by Bomb calorimeter
19. Fat by Soxhlet method

SEMESTER-II

Core Paper: 5

NUTRITIONAL BIOCHEMISTRY

SUB CODE:

Hours: 5

Marks: 100

Credit: 5

Objectives

1. To develop students' knowledge, understanding and skills in nutritional biochemistry
2. To understand the role of metabolism in human nutrition

Outcome

1. The students understand the principles of biochemistry and apply the knowledge to human nutrition.
2. Describe the biochemical and physiological functions of the nutrients and their integrated role.
3. Evaluate the therapeutic role of key nutrients in maintaining health.

UNIT I

Carbohydrate metabolism: Classification, Review of digestion and absorption. oxidation of glucose – glycolysis, oxidative decarboxylation, citric acid cycle. Pentose phosphate pathway.

Glycogen- Glycogenesis, Glycogenolysis. Gluconeogenesis. Inborn errors of metabolism. Glycogen storage diseases.

UNIT II

Protein metabolism: Classification of protein, Review of digestion and absorption. Deamination, transamination, trans-deamination, decarboxylation, deamidation, Urea cycle, inborn errors of amino acid metabolism.

Enzymes – Classification and Role of Enzymes.

UNIT III

Lipid metabolism: Classification, Oxidation of fatty acid- α , β , & ω . Bio synthesis of fatty acid & TGL, Cholesterol synthesis & synthesis of bile acids & bile pigments, ketosis, ketone bodies, acidosis & fatty liver.

UNIT IV

Nucleic acid metabolism: Classification, Biological oxidation, Electron transport chain, nucleic acid metabolism, structure of DNA & RNA, genetic code, DNA replication, bio synthesis of protein.

UNIT V

Basics of instrumentation: Principle and methodology of colorimetry, fluorimetry, flame photometry, atomic absorptiometry, chromatography, electrophoresis and bioassays- animal, human and microbiological.

References

1. Deb. A.C., Fundamental of Biochemistry, New Centruy Book Agency (P) Ltd, Reprint 2004.
2. Ambika Shanmugam, Fundamentals of biochemistry for Medical students, Karthik Pprinters, 7thedition, 1992.

3. U.Sathyanarayana and U.Chakrabani, Biochemistry, Third Edition, Uppala- Author Publishers, 2007.
4. Mahtab. S.Bamji, Kamala Krishnaswamy and G.N.V Brahmam, Text Book of Human Nutrition, Oxford and IBH Publishing Company, Third Edition.2009

Web Resources:

- www.virutal library biochemistry
- [http:// themedicalbiochemistrypage.org](http://themedicalbiochemistrypage.org)

SEMESTER-II

FOOD SCIENCE II

Core paper: 6

SUB CODE:

Hours: 4

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Understand the composition and nutritive value of animal products, vegetables, fruits, fats, oils, nuts and spices.
2. Understand the changes that are taking place during cooking of animal products, fruits, vegetables, fats and oils.

Outcome

1. Comprehend the knowledge gained on characteristics and properties of animal foods vegetables, fruits, fats, nuts and oilseeds during cooking
2. Apply the properties of animal foods vegetables, fruits, fats, nuts and oilseeds in various food processing and preparations

3. Analyze the factors affecting cooking quality of animal foods vegetables, fruits, fats, nuts and oilseeds
4. Develop appropriate food preparation and processing methods to ensure quality standards.

UNIT – I

Egg: Structure, composition and nutritive value, quality of egg – factors determining and evaluation. Egg cookery: Effect of cooking on nutritive value, effect of heat on egg protein, factors affecting coagulation of egg proteins, effect of other ingredients on egg proteins; egg white foam – factors affecting; role of egg in cookery, designer eggs.

Poultry: Classification, composition and nutritive value, processing and cooking.

UNIT – II

Meat: Classes of meat, structure, composition and nutritive value; post-mortem changes in meat, ageing, tenderising, curing; cuts and grades of meat. Meat cookery: Factors affecting cooking quality, changes in meat on cooking, tenderness and juiciness of meat.

Fish: Classification, composition and nutritive value, selection. Fish cookery: Principles and methods.

UNIT – III

Vegetables: Classification, composition and nutritive value, pigments, organic acids, enzymes, flavour compounds, bitter compounds, selection of vegetables. Vegetables cookery: Changes during cooking, loss of nutrients during cooking, effect of cooking on pigments, role of vegetables in cookery and points to be remembered while cooking vegetables.

Fruits: Classification, composition and nutritive value, pigments, cellulose and pectic substances, changes during cooking, flavour constituents, polyphenols, bitterness, post-harvest changes and ripening. Browning: Types and prevention, points to be considered while serving fruits.

UNIT - IV

Nuts and Oilseeds: Classification, composition and nutritive value, toxins present in nuts, role in cookery.

Fats and oils: Nutritional importance of fats and oils, functions of oils and fats in foods, flavour changes – Rancidity – types and prevention, reversion.

Sugar: Sources, properties, types, forms, liquid sweeteners, reactions of sugar Crystallisation: Factors affecting, role of sugar in cookery, stages of sugar cookery, crystalline and non-crystalline candies.

UNIT – V

Spices: Classification, general functions, commonly used spices, herbs in cookery

Aromatics – Composition and uses, role of spices in cookery.

Beverages: Classification and points to be considered while preparing beverages.

REFERENCES

1. Srilakshmi. B; Food Science, 6th edition New Age International (p) Limited Publishers 2015.
2. Shakunthala manay N; Shadakshara swamy. M; Foods Facts and Principles, Third edition, New Age International (p) Limited Publishers, 2014.
3. Lillian Hoagland meyer, Food chemistry, CBS Publishers and distributors, 2004.
4. Arindam Ramaswamy, Elements of Food Science, Oxford book company, 2010.
5. Norman N. Potter, Joseph H. Hotchkiss, and food science, fifth edition, CBS publishers and distributors, 1996.
6. B. Sivasankar, Food Processing and Preservation, PHI Learning Private Limited, 2011.

Web Resources:

- <https://guides.libraries.psu.edu/foodscience>
- <https://www.nal.usda.gov/fnic/food-science-and-technology>
- <https://foodinfo.ifis.org>

SEMESTER-II

MEDICAL NUTRITIONAL THERAPY – I

Core paper: 7

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

1. To understand the etiology, physiological and metabolic anomalies of acute and chronic disorders / diseases
2. To understand the effect of various disorders / diseases on nutritional status, nutritional and dietary requirements

Outcome

1. Know the importance and principles of dietetics as a distinct therapy for diseases
2. Gain knowledge on the types and role of dietitians
3. Understand the different therapeutic diets
4. Learn the dietary management for gastrointestinal, liver and gall bladder diseases.
5. Relate dietary management for nutritional deficiency diseases

UNIT I

Principles of clinical nutrition–Introduction, the spectrum of nutritional problems and management pathways. Perspectives on the future. Diet therapy and types of therapeutic diets, Role of dietitian and Indian Dietetic Association. The influence of drugs on the nutritional status

of patients. Special Feeding Method: Intravenous feeding, tube feeding, gastrostomy, jejunostomy – Meaning, objectives, Technique, Nutrients and Diet.

UNIT II

Nutritional therapy during energy imbalance: Over nutrition and under nutrition - Introduction, etiology, clinical assessment, treatment approaches – general principles, lifestyle changes and nutritional management.

Eating disorders: Anorexia nervosa, bulimia nervosa, binge eating disorder – History, etiology, clinical features, epidemiology and nutritional management.

UNIT III

Adverse reaction to foods: Introduction, food intolerance, food allergy, types of food allergy, patterns of food allergic responses, diagnostic criteria for food allergy, specific food allergies, multiple food allergy, scientific background: The basic mechanisms of immune response to dietary antigen.

Infection and fevers – Defense mechanisms in the body, Role of Nutrition in Infections, effects of infection on body mechanisms , effects of infection on nutrition, definition of fever, nutritional modification in infection and fever.

UNIT IV

Metabolic disorder: Diabetes Mellitus – Introduction, types, pathophysiology of insulin resistance, symptoms, biochemical tests, complications, hypoglycemic drugs, dietary management, patient education, the diabetic association of India.

UNIT V

Gastro intestinal tract disorders: Dyspepsia, peptic ulcer, diarrhoea, constipation, inflammatory bowel disease – definition, epidemiology, pathogenesis, clinical features and diagnosis, dietary management. Diseases of Liver;-Hepatitis, (A, B, and C), Cirrhosis - Causes, symptoms, dietary management and Prevention.

REFERENCES

1. Michael. J. Gibney etal; Clinical Nutrition Black well Science, 2005.
2. Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.
3. Srilakshmi . B; Nutrition Science, 15th edition, New Age International (p) Limited, publishers, 2016.
4. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD, Reprint 2015.
5. Sunetra Roday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.
6. Carol Byrd – Bredbenner; Wardlaw’s perspectives in Nutrition, 9th edition McGraw – Hill International Edition, 2013.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- <https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf>
- krishikosh.egranth.ac.in

SEMESTER-II

FOOD PROCESSING AND QUALITY CONTROL

Elective paper: 2

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students

1. To gain systematic knowledge of basic and applied aspects in food processing and technology.

2. To optimise process parameter for consistent quality of processed food products.

Outcome

1. Know the basic concepts of food processing and recent trends in processed foods
2. Understand the relevance of processing for various food commodities.
3. Learn about the applications of quality management in food industry.
4. Define different food laws and regulations for quality control in food industry.

UNIT I

Cereal technology: Rice- Milling, parboiling: Methods, advantages and disadvantages, byproducts of rice milling and their utilization. Wheat: Milling process, byproducts of wheat milling. Millets: Milling of major and minor millets. Malting and fermentation. Manufacturing of breakfast cereals: Extruded products, puffing, flaking.

Pulse technology: Milling of soya bean and Bengal gram and their byproducts, germination, fermentation, parching, popping, processed soya products.

UNIT II

Nuts and oil seeds processing: Milling, techniques in extraction of oil, byproducts- Meal concentrates, isolate. Specialty fats, hydrogenation, production of MCT. Fat replaces and their uses.

Dairy technology: Milk processing: Separation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, membrane fractionation. Manufacturing of cheese, butter, khoa, yoghurt, srikhand, ice cream, condensed milk and dry milk. Milk substitutes- Lactone, infant formula. Byproducts: Skimmed milk, lassi, butter milk, whey, ghee residue.

UNIT III

Fruits and vegetable technology: Dehydration, juice concentrate, canning of fruits and vegetables. Potato processing and its products (wafers and French fries). Fleshy food

technology: Processing of fish for smoking, canning and freezing. Curing of meat, Poultry processing, Pasteurization of egg, manufacture of egg powder and frozen egg products.

UNIT IV

Quality assurance: Introduction; FSSAI- acts and regulations; Product standards- CODEX standards, FSSAI standards, AGMARK, ISI.

Process control- GMP, GHP, GLP, HACCP-Principles and plan.

UNIT V

Food product evaluation: Sampling for evaluation, sample preparation, list of quality parameters for perishable, semi perishable and nonperishable foods.

Sensory evaluation of food products- Subjective and objective.

REFERENCES

1. Srilakshmi. B; Food Science, 6th edition, New Age International (P) Limited Publishers, 2015.
2. Shakunthala Manay. N; Shadakshara Swamy.M; Foods Facts and Principles, 3rd edition, New Age International (P) Limited Publishers, 2014.
3. Lillian Hoagland Meyer, Food chemistry, CBS Publishers and Distributors, 2004.
4. Subbulakshmi. G and Shobha. A.U; Food processing and preservation, New Age International (P) Limited Publishers, 2014.
5. Norman. N Potter, Joseph H. Hotchkiss, Food Science, 5th edition, CBS Publishers and Distributors, 1996.
6. Sivasankar. B; Food Processing and Preservation, PHI Learning Private Limited, 2011.

Web Resources:

- <http://www.foodsafe.ca>

SEMESTER-II

Core practical: 2 FOOD QUALITY CONTROL PRACTICAL

SUB CODE:

Hours: 5

Marks: 100

Credit: 3

1. Estimation of titrable acidity.
2. Estimation of total solids.
3. Estimation of specific gravity in foods.
4. Analysis of pectin in foods.
5. Estimation of lactose in milk.
6. Estimation of tannins in tea.
7. Test for rancidity in oils – Kries test.
8. Food adulteration- Tests to detect adulteration.
9. Determination of gluten content of flour.
10. Determination of bulk density, true density and porosity.
11. Determination of physical dimensions of grain- length, breadth, thickness and sphericity.
12. Sensory analysis of foods
13. Preparation and inoculation of growth media- Inoculation and incubation-counting of microbes.

SEMESTER- III

RESEARCH METHODOLOGY FOR NUTRITION AND STATISTICS

Core Paper: 8

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Understand the methods of researches that can be applied in the field of food and nutrition.
2. Understand the application of statistical calculations in the interpretation of results of research problems.

Outcome

1. Design the tools for collection, identification and interpretation of data with the use of tables and pictorial representations.
2. Assess the numerical data for providing statistical evidences to support the research results.
3. Enable to become a qualified researcher

UNIT I

Research methodology: An introduction- Meaning, Objectives, Motivation, Types and Significance of research, Research methods versus methodology, Research and scientific method, Research process. Defining the research problem- Selecting, Necessity, Technique and An Illustration in defining the problem. Research design- Meaning, Need, Features, Important concepts and different research designs. Sampling design- Census, Sample survey, Steps, Characteristics and Types of sampling design.

UNIT II

Methods of collecting primary data- Questionnaire, preparation of schedules, Interview method, case- study method, Experimentation method, Data Collection – Primary and secondary data, Sources of secondary data, precautions while using secondary data. Editing and coding the data, Organization of data- Classification – meaning and objectives, types of classification, formation of discrete and continuous frequency distribution, Tabulation – Role, parts of a table, general rules of tabulation, Types of tables.

UNIT III

Representation of data – Diagrammatic and graphical representation , Significance of diagrams and graphs, General rules for constructing diagrams, Types of diagrams, graphs of Time series, graphs of frequency distribution. Interpretation and Report writing- Meaning of interpretation technique, precautions, Format of research report, types, steps and stages, mechanism and style, precautions and essential for good report, footnotes and bibliographical citations.

UNIT IV

Measures of central Tendency – Mean, Median, Mode, their relative advantages and disadvantages, Measures of dispersion- Mean deviation, standard deviation, quartile deviation. Co-efficient of variation, percentile and percentile ranks. Association of attributes, contingency tables, correlation, coefficient of correlation and its interpretation, rank – correlation, regression equations and predictions. Scales of measurement and the appropriate statistical techniques.

UNIT V

Probability - Rules of probability and its applications. Distribution - Normal, binomial, their properties, importance of these distributions in statistical studies. Tests of significance, large and small samples, “t” and F test, tests for independence using chi-square test. Analysis of variance- One – way and two way classification.

REFERENCES

1. Kothari, C.R; Research Methodology, 2nd edition, New Age International Publishers,2004.
2. Gupta, S.P; Statistical Methods, 31st revised edition, Sultana Chand and Sons, 2002.
3. Devadas, R.P; A Handbook on Methodology of Research, Sri Ramakrishna Vidhyalaya, Coimbatore, 1989.
4. Donald, H.M.C. Burney; Research Methods, fifth edition, Thomson and Wadsworth Publications, 2002.

5. Pillai,R.S.N and Bagavathi,V , Statistics, Chand and company limited, 2001 .

Web Resources:

- <https://explorable.com/research-methodology>
- <https://www.mbaknol.com/research-methodology/the-basic-types-of-research>

SEMESTER-III

MEDICAL NUTRITIONAL THERAPY- II

Core paper: 9

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives:

1. To enable the students to remain updated on recent advances in diet therapy for various diseases.
2. To gain knowledge to recommend nutritional care for prevention treatment of various diseases.

Outcome

1. Learn about etiology, clinical symptoms, diagnosis, treatment and dietary modifications in renal, pancreatic and pulmonary diseases
2. Understand the functions, clinical symptoms and damages caused in various liver diseases
3. Enumerate on functions of kidney and the damages, clinical symptoms and dietary modifications of various cardiovascular diseases
4. Gain knowledge on causes, nutritional care and treatment of cancer and HIV

UNIT-I

Diet for kidney diseases: Etiology, symptoms, diagnosis and dietary management of Glomerulonephritis, Nephrotic Syndrome, Acute and chronic renal failure and Urinary calculi.

Dialysis: Hemodialysis and Peritoneal dialysis- Advantages, disadvantages and Dietary management. Kidney Transplant: Diagnosis and dietary management.

Diet for pancreatic diseases: Pancreatitis- Pathogenesis of acute and chronic pancreatitis, severity scores, artificial nutrition, future directions.

UNIT-II

Diet for pulmonary diseases: Etiology, symptoms, diagnosis and dietary management of Chronic Obstructive Pulmonary disease, asthma, pneumonia, and tuberculosis.

Rheumatoid Arthritis: Types, etiology, symptoms and dietary management

Osteoarthritis: Types, etiology, symptoms and dietary management

Gout: Etiology, symptoms and dietary management.

UNIT-III

Dietary management for cardio-vascular diseases: Atherosclerosis, coronary heart disease, hypotension, hypertension, stroke, cardiac arrest- Risk factors, definition, epidemiology, pathogenesis, clinical features, diagnosis and dietary management.

UNIT-IV

Cancer: Types, mechanism, etiology, metabolic changes and dietary management during cancer treatment (drugs, chemotherapy and radio therapy).

AIDS: Causes, symptoms, metabolic changes, diagnosis, treatment and dietary management

Nutrition for children with special needs: Ketogenic diet – Epilepsy. Neutropenic diet – marrow transplant and Nutrition for Autism.

UNIT-V

Surgery and Critical Care: Metabolic & clinical aberrations, diagnosis, complications, treatment, dietary management of Surgery, Burns, Sepsis, Trauma and Critical care.

Nutrient – Drug interactions.

REFERENCE:

1. Ganongs. W.F; Review of medical physiology, 1985.
2. Campbell. E.J et al; Clinical and applied physiology,1984.
3. Guyton AC and Hall JB; Textbook of medical physiology, 1996.
4. Guyton AC; Functions of human body, 1985.
5. Wilson KJW and Waugh A; Ross and Wilson. Anatomy and Physiology in health and illness, 8th edition, 2003.
6. Judith E. Brown., Nutrition New, 2nd edition, West / Wadsworth west / Wadsworth,

An International Thomson publishing company, 1998.

7. Clinical Dietetics and Nutrition – F P Anita and Philip Abraham.

8. Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.

9. Normal and Therapeutic Nutrition – Robinson & Lawler, 17th edition, Mac Millan Publishers.

10. Clinical Nutrition – Ed Michael J Gibney, Marinos Elia, Olle Ljungqvist and Julie Dowsett.

11. Nutrition in Clinical Practice – David L. Katz, Lippincott, Williams & Wilkins.

12. Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.

13. Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- <https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf>
- krishikosh.egranth.ac.in

SEMESTER-III

MICRONUTRIENTS

Core paper: 10

SUB CODE:

Hours: 5

Marks: 100

Credit: 5

Objectives

1. To understand the structure and functions of micro nutrients in human body
2. To understand the effects of deficiency and excess of micro nutrients in human body.

Outcome

1. Gain in depth knowledge on the physiological and metabolic role of Vitamins.
2. Outline the role of vitamins in health and disease.
3. Assess the physiological action of vitamins and minerals.

4. Acquire in depth knowledge of macro and micro minerals and their role in human health and diseases.
5. Enable to understand the inter relationship between vitamins and minerals

UNIT – I

Fat soluble vitamins: Vitamin A, D, E and K – Food sources, RDA, functions, absorption, transport, storage, deficiency and toxicity.

UNIT – II

Water soluble vitamins: Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, B6, Folate, Vitamin B12, Vitamin C – Food sources, RDA, function, absorption, transport, storage, excretion and deficiency.

UNIT – III

Major minerals: Sodium, Potassium, Calcium, Phosphorus, Magnesium and Chloride – Food sources, RDA, functions, absorption, transport, storage, excretion and deficiency.

UNIT- IV

Trace Minerals: Iron, Zinc, Copper, Iodine, Selenium, Manganese, Fluoride – Food sources, RDA, functions, absorption, transport, storage, excretion and deficiency.

UNIT – V

Interrelationship Between nutrients: Protein – energy interrelationship, Effect of carbohydrates, fats and proteins on vitamin requirements, vitamin – vitamin interrelationship, vitamin - mineral interrelationship, mineral – mineral interrelationship. Effect of malnutrition on immunity

REFERENCES

1. Michael. J. Gibney etal; Clinical Nutrition Black well Science, 2005.
2. Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.

3. Srilakshmi . B; Nutrition Science, 15th edition, New Age International (p) Limited, publishers, 2016.
4. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD, Reprint 2015.
5. Sunetra Roday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.
6. Carol Byrd – Bredbenner; Wardlaw’s perspectives in Nutrition, 9th edition McGraw – Hill International Edition, 2013

Web references

<http://www.nutritionfoundationindia.res.in>

nhp.gov.in/healthyliving/healthydiet

<http://www.nin.res.in>

SEMESTER-III

COMMUNITY NUTRITION

Core paper:11

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Remain updated on recent advances in policies, nutrition monitoring and education methods.
2. Develop an understanding about various programs and agencies involved for the improvement of nutritional status of the community.

Outcome

1. Gain knowledge on nutritional programmes and policies to overcome malnutrition
2. Understand the role of national, international and voluntary nutritional organizations to combat malnutrition
3. Able to organize community nutrition education programme with the application of computers.
4. Apply immunological intervention programmes to overcome epidemic of communicable diseases.
5. Application of the principles of massive supplementary feeding and food safety during unforeseen disasters

UNIT – I

Nutrition and national development: National Nutrition Policy – aims and objectives; Demographic Profile: Population trends in India, density of population, age structure, sex ratio, family size, literacy and education, life expectancy. Nutrition and Infection: Vicious cycle of malnutrition and infection.

UNIT – II

Assessment of nutritional status: Methods of nutritional assessment, nutritional anthropometry, growth standards, dietary and clinical assessment, biochemical and radiological assessment.

Problems in human nutrition: Obesity, underweight, anemia, vitamin A deficiency, iodine deficiency disorders, rickets, osteomalacia, osteoporosis and flurosis.

UNIT – III

Nutrition monitoring: Objectives, agencies engaged in nutrition monitoring; vital statistics – IMR, Crude Birth Rate, fertility rate, MMR, under five mortality rate.

Strategies to combat nutritional deficiencies: Food fortification, food enrichment, nutrition and health education, vitamin A prophylaxis program, prophylaxis against nutritional anemia, control of IDD.

UNIT – IV

Nutrition education: Scope of nutrition education, steps in planning, conducting and evaluating nutrition and health education programmes; methods of imparting nutrition education; monitoring and evaluation of effectiveness of nutrition and health education programmes.

UNIT- V

Food security: Definition, factors affecting food security systems, food security programmes – PDS, AAY, Annapurna scheme, Food for work programme.

Nutrition intervention programmes: ICDS, Supplementary feeding programme, special Nutrition Programme, PMAY, Composite Nutrition Programme, Applied Nutrition Programme.

National and International Organisations: Engaged in food and nutrition activities – ICMR, NIN, NNMB, ICAR, CFTRI, FAO, WHO, UNICEF, UNESCO.

REFERENCES

1. Park K., Preventive and social medicine, Bamarasidas Bahnot Publishers, Jabalpur.
2. Jellilfe D. B., Infant nutrition in tropics and subtropics, WHO, 1965.
3. Bamji M. S., Prahalad Raov, Reddy V, Text book on human nutrition, Oxford and IBM publishing co. Pvt. Ltd.
4. Proceeding of Nutrition Society of India, NIN.
5. Technical reports of ICMR .
6. P.K. Shukla, Nutritional problems of India, Prentice Hall, India.

Web Resources:

- <https://www.nutrition.gov>

- <http://www.ninindia.org/community.htm>
- <https://www.nhp.gov.in/healthyliving/healthy-diet>

SEMESTER-III
FOOD BIOTECHNOLOGY

Elective Paper- 3

SUB CODE:

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Remain updated on recent advances in the application of genetic engineering in food.
2. Develop an understanding about nano biotechnology in food industries.

Outcome

1. Gain knowledge on the techniques and tools of genetic engineering
2. Understanding fermentation and applications of enzyme technology in food industries.
3. Analyze plant and animal tissue culture in the production and safety of transgenic plants and animals.
4. Explore microbial metabolic pathways in the production of microbial by-products.
5. Elucidate the nutritional and safety aspects of genetically modified foods

UNIT I

Biotechnology – Introduction – biotechnological applications of animals, plants and microbes; concepts of genetic engineering and molecular cloning and their application in food production, transgenic plants, application of genetic engineering in food science and technology. Genomics, proteomics and bio informatics.

UNIT II

Classical strain improvement: Natural selections and mutation, recombination. Concepts and tools for recombinant DNA technology; genetically modified foods: concept, types and applications; safety assessment of genetically modified foods: International and National guidelines of regulations and safety, issues related to production, consumption, export / import and labelling of GM foods. Ethical issues concerning GM foods, Testing for GMOs, IPR, GMO Act 2004.

UNIT III

Application of biotechnology to food products: Yeast based processes and products – alcoholic beverages, industrial alcohols, bread and related products; Bacteria based processes and products – dairy products, fermented meat and fish products, fermented vegetable products, vinegar and other organic products, bacterial bio mass.

UNIT IV

Application of enzymes in food and beverages industries. Enzyme immobilization and its application in food industry: History, carrier materials, enzyme immobilization techniques, use of immobilized enzyme in food industries. Microorganism based products – sweeteners, flavours and amino acids, vitamins and pigments, mushrooms, SCP.

UNIT V

Application of Nano biotechnology in food industry: Nano biotechnology in food packaging, nano biotechnology for delivery of bioactives and nutraceuticals, nanobiosensors – safety and regulatory aspects of nanobiotechnology applications.

Micro encapsulation in food biotechnology: concepts, agents and techniques; application of micro encapsulation – probiotics, flavours, lipids, antioxidants, vitamins and enzymes.

REFERENCES

1. Byong H. Lee, fundamentals of food biotechnology, II editions, wiley – Blackwell, 2014.

2. Ravishankar Rai, V. Advances in food biotechnology, wiley – Blackwell, 2015.
3. Bains W. biotechnology from A to Z, Oxford , University Press, 2009.
4. Lopez, G.F.G., Canovas, G.V.B., Food science and Food Biotechnology , CRC Press, 2003.
5. Knorr. D., Food Biotechnology, marcel Delller, Newyork, 1982.
6. Crueger, W. Crueber A, Biotechnology; A text book of Industial microbiology, science Ttech. Madison, USA, 1984.

Web resources

www. ms-biotech.wisc.edu

dbtindia.gov.in

www.bio.org

SEMESTER-III

MEDICAL NUTRITIONAL THERAPY PRACTICAL

Core practical: 3

SUB CODE:

Hours: 5

Marks: 100

Credit: 3

Outcome

- . 1. Understand the etiology and pathophysiology of metabolic and degenerative diseases.
2. Gain knowledge on the role of diet therapy during the various diseases
3. Apply the knowledge in planning diets for the disease conditions
4. Counsel on the dietary management
5. Equip to become a dietitian

I. Standardization of common food preparations.

II. Planning, preparation and calculation of nutritive value for the following diets using SOAP format

1. Planning and preparation of all types of therapeutic diets
2. High fibre and low caloric diet
3. Diet for Energy imbalance
4. Diet for Diabetes Mellitus
5. Diet for Cardio-vascular diseases
6. Diet for Kidney Diseases
7. Diet for Gastrointestinal diseases
8. Diet for Liver diseases
9. Diet for pancreatic diseases
10. Diet for Infections and fevers.
11. Diet for surgery and trauma
12. Diet for cancer

SEMESTER-III

INTERNSHIP REPORT

Core viva voce: 1

SUB CODE:

Marks: 100

Credit: 3

Outcome

1. Gain skill in planning therapeutic diets
2. Ability to be a health professional
3. Apply the knowledge for diet counselling
4. Competent to manage catering outlet
5. Initiate entrepreneurship venture

INTERNSHIP REPORT: EVALUATION PATTERN

Students gain hands on training in a food industry or hospital or health centers
Compulsory Internship Programme for 30 days in any one of the following discipline.

1. Food Industry
2. Hospital
3. Health/fitness Center

Report on internship will be evaluated as stated below.

External marks	-	60
Internal marks	-	40

Total marks	-	100

Internal mark components

Marks awarded by the training institution- 20 marks

Marks awarded by the guide - 20 marks

External mark components

Report preparation - 20 marks

Report presentation - 20 marks

Viva voce - 20 marks

SEMESTER-IV

NUTRITION FOR HEALTH AND FITNESS

Core paper: 12

Hours: 5

Marks: 100

Credit: 5

Objectives

Study of this paper will enable the students to

1. Understand the characteristics, physiology, body composition and nutritional needs for health and sports.
2. Imbibe knowledge on sports specific nutrition guidelines.

Outcome

1. Understand concept of fitness training
2. Foster fitness skills
3. Prevent and manage lifestyle related disorders
4. Utilise exercise in stress and health management
5. Gain the technical ability to run fitness centers
6. Understand the nutritional needs of athletes and plan diet for them

UNIT I

Physical fitness- Definition, components, methods of assessing; definition and scope of fitness nutrition; holistic approach to the management of fitness and health- diet and exercise, effect of specific nutrients on work performance and physical fitness; Nutrition, exercise, physical fitness and health inter relationship.

UNIT II

Nutrition for individuals who exercise- Carbohydrates, proteins, fats, electrolytes, vitamins, minerals, hydration and exercise; role of antioxidants in fitness and health; fueling before, during and after exercise. Energy systems for endurance and power activity- Fuels and nutrients to support physical activity. Shifts in carbohydrate and fat metabolism. Mobilisation of fat stores during exercise.

UNIT III

Nutrition in sports- Sports specific requirement; diet manipulation; pre-game and post-game meals. Ergogenic aids- definition, popular and famous ergogenic aids, assessment of different nutrigenic aids and commercial supplements.

UNIT IV

Nutritional care for child, adolescent, young, geriatric and master athletes; vegetarian athlete, female athlete, athletes with special needs.

UNIT V

Significance of physical fitness and nutrition in the prevention and management of weight control, diabetes mellitus, CV disorders, bone health and cancer. Nutritional management of obesity- review of various dietary regimes for weight and fat reduction. Nutritional guidelines appropriate to health, fitness, prevention and management of these chronic degenerative disorders.

REFERENCE:

1. Slater, G., & Phillips, S. M. (2011). Nutrition guidelines for strength sports: sprinting, weightlifting, throwing events, and bodybuilding. *Journal of sports sciences*, 29(sup1), S67- S77.
2. Helms, E. R., Aragon, A. A., & Fitschen, P. J. (2014). Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation. *Journal of the International Society of Sports Nutrition*, 11(1), 20.
3. Maughan, R. J., & Burke, L. M. (2012). Practical nutritional recommendations for the athlete. In *Sports Nutrition: More Than Just Calories-Triggers for Adaptation* (Vol. 69, pp. 131-150). Karger Publishers .
4. Jeukendrup, A., & Gleeson, M. (2010). *Sport nutrition: an introduction to energy production and performance* (No. Ed. 2). Human Kinetics.

Web Resources:

- <http://www.aco.org.nz/pdf/nutrition-for-sports>
 - https://www.researchgate.net/publication/258630492_Sports_Nutrition_Book_2013
- <http://themedicalbiochemistrypage.org>

SEMESTER-IV

NUTRACEUTICALS

Elective paper: 4

Hours: 5

Marks: 100

Credit: 4

Objectives

Study of this paper will enable the students to

1. Understand nutraceutical properties of foods.
2. Develop an understanding about the application of nutraceutical in diet therapy.

Outcome

1. Understand the developments in the field of nutraceuticals and nutrigenomics.
2. Comprehend the components of functional foods and foods containing nutraceuticals
3. Know the importance of probiotics and prebiotics in human health
4. Understanding the effects of nutrients in molecular level process in the body and the effect of phytochemicals in disease conditions.

UNIT I

Nutraceuticals or functional foods – History, definitions, functional food versus pharmaceuticals, classification. Nutraceutical properties of nutrient components of foods: Proactive carbohydrates – Trehalose, poly saccharides, soluble fibers (pectin, guar gum and β – glucons), insoluble fiber, resistant starches (their role in blood lipids, mineral absorption, control of blood glucose, risk of developing colon cancer), slowly digestible starches;

Prebiotics – definition, inulin, oligo saccharides and lactulose as prebiotic compounds and polyphenols as prebiotics.

UNIT II

Nutraceutical properties of bioactive lipids – Butyric acid, medium chain fatty acids, long chain fatty acids (MUFA, PUFA, omega-3 and omega-6 fatty acids) and conjugated linoleic acid as nutraceuticals.

Nutraceutical properties of bioactive peptides – Antihypertensive peptides, antilipidemic and antidiabetic peptides, opioid peptides, caseinophospho peptides, calmodulin – binding peptides, antioxidant peptides, anticancer and immune – modulating peptides, antithrombotic peptides; co-enzyme – Q10.

UNIT III

Nutraceutical properties of bioactive polyphenols and carotenoids: Polyphenolic products – Grape and red wine polyphenol extracts, resveratrol, apple polyphenols, lychee fruit polyphenols, curcumin, phytosterols, proanthocyanidins, plant anthocyanins, Pomace olive oil Triterpenoids; carotenoids – Lycopene.

Nutraceutical properties of specific functional foods: food from plant sources – soybean: bioactive components and their role in CVD, renal diseases, cancer, bone health, menopause, cognitive function; cereal grains: Amaranth, Barley and Wheat.

UNIT IV

Nutraceutical properties of vegetables, fruits, nuts and oil seeds: Bio active components of tropical fruits and citrus fruits and berries and their functional properties; bio active compounds of cruciferous vegetables and their biological activities. Health benefits of olive oil and flax seeds.

Nutraceutical properties of spices and herbs: Cinnamon, turmeric, ginger, garlic, onion, pepper fruit.

UNIT V

Nutraceutical properties of foods from animal sources: milk and milk products – whey protein, lactoferrin, colostrum, immunoglobulins, milk glycoproteins and sugar; Probiotics and their health benefits; role of milk fatty acids in CVD.

Fish: Proactive components and their role in CVD, brain function, cancer, immune system, diabetes, obesity, kidney disease, digestive tracts.

Nutraceutical properties of miscellaneous foods: Seaweeds, tea and honey.

REFERENCES

1. Dhiraj A. Vattem and Vatsala maitin, Funtional foods, Nutraceutical and Natural products – concepts and applications, DES tech publications, 2016.
2. Aluko and Rotimi E , Funtional foods and Nutraceuticals, springer publications, 2012.
3. Robert E.C . Wildman, Handbook of Nutraceutical and Funtional foods, II edition, CRC press, 2006.
4. Brian Lockwood, Nutraceutical, II editions,
5. Gibson GR and William CM. Funtional foods – concept to product, 2000.

Web Resources:

- <https://www.nutraceuticalsworld.com/>
- <https://www.nutraingredients.com/>

SEMESTER-IV

BIOCHEMICAL TECHNIQUES PRACTICAL

Core practical: 4

SUB CODE:

Hours: 5

Marks: 100

Credit: 3

Outcome

1. Gain knowledge about various investigations and their interpretations
2. Learn to monitor the course of a disease or to assess a patient's response to treatments.
3. Correlate the tests used for various organs with the disorders.
4. Investigate the normal and abnormal functions of organs
5. Judge about the treatment regimen

I .Analysis of Blood / Serum

1. Blood glucose
2. Serum iron
3. Serum cholesterol
4. Serum protein
5. Serum vitamin – A
6. Blood Haemoglobin

II. Analysis of urine

1. Creatinine
2. Urea
3. Total nitrogen
4. Calcium
5. Phosphorus
6. Vitamin – C

III. Qualitative Analysis

1. Qualitative analysis of sugars

- a. Reactions of Monosaccharide (Glucose, fructose, galactose, mannose and ribose)
- b. Reactions of disaccharides (Maltose and lactose)
- c. Reactions of polysaccharides (Starch and dextrin)
- d. Analysis of unknown sugars

2. Qualitative analysis of amino acids

- a. Reactions of individual amino acids (Tyrosine, tryptophan, arginine, histidine, cystine and methionine)
- b. Analysis of unknown amino acids

SEMESTER-IV

DISSERTATION

Core viva voce: 2

SUB CODE:

Hours:15

Marks: 100

Credit: 5

DISSERTATION: EVALUATION PATTERN

Internal evaluation (40 marks)

Innovative idea - 10 marks

Performance evaluation - 10 marks

Report preparation - 20 marks

External evaluation (60 marks)

Report and presentation - 40 marks

Viva voce - 20 marks

EXTRA DICIPLINARY PAPER (EDC)

SEMESTER-II

BASIC NUTRITION

EDC PAPER: 1

Hours: 4

Marks: 100

Credit: 4

Objectives

1. To understand the structure and functions of nutrients in human body.
2. To understand the effects of deficiency and excess of nutrients in human

Body

Outcome

Non nutrition students understand and apply the basic concepts of nutrition

UNIT I

Carbohydrates: Classification, functions, digestion, absorption, recommended dietary allowances sources.

Lipids: Classification, functions, digestion, absorption, recommended dietary allowances, sources, deficiency, dietary fat and coronary heart disease.

UNIT II

Proteins: Nutritional classification of proteins, Nutritional classification of Amino Acids, function, digestion and absorption, complementary value of proteins, recommended dietary allowances, sources.

Energy: Units, components of energy requirement, measurement of energy, basal metabolic rate, energy requirements during work, thermic effect of food, factorial method of measuring total energy expenditure, factors affecting basal metabolic rate, recommended dietary allowances, sources.

UNIT III

Minerals: Calcium, magnesium, phosphorus, iron, iodine, zinc, copper, sodium- food sources, requirement, functions and deficiency

UNIT IV

Vitamins: vitamin A, C, D, E, Thiamin, riboflavin, folic acid – Food sources, requirement, functions and deficiency

UNIT V

Balanced Diets: Definitions, five food group system, food exchange lists, the food guide pyramid, planning diets, dietary guidelines for different age groups, Indian nursing mothers.

REFERENCES

B. Srilakshmi; Human Nutrition, New Age International (P) Limited, Publishers, 2014

Web references

<http://www.nutritionfoundationindia.res.in>

nhp.gov.in/healthyliving/healthydiet

<http://www.nin.res.in>

